

# ENGINEUNITY TUTORIAL



**BIM**  
**(Building Information Modelling)**



## OVERVIEW OF BIM

### **BIM is an acronym for Building Information Modelling.**

It describes the process of designing a building collaboratively using one coherent system of computer models rather than as separate sets of drawings, which is the traditional method.

It is a digital representation of physical and functional characteristics of a facility, and a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.

At the technical core of BIM is the software that enables 3D modelling and information management. Extensive use of the software eventually leads to a more complete understanding of the technical core.





## BENEFITS

BIM offers enormous gains in saving in cost and time, much greater accuracy in estimation, and the avoidance of error, alterations and rework due to information loss.

To achieve all the benefits BIM offers, everyone in the architecture, engineering and construction industries will have to learn to work in fundamentally new ways.



**We will now take a look at how BIM is used within Enginuity.**



# BIM (Building Information Modelling)

MAKING Procurement decisions for period 5 in the Early Years

Change period Assessing performance Industry information Help

The **BIM status column** indicates if a job is using a BIM model.

## KEY POINTS

Both Build Only (BO) and Design & Build jobs (DB) can use a BIM model .

### OF WORK IN PROGRESS

The initial forward workload is: 20,791,350 (job progression screen)  
 Current value of the capital base is: 4,238,978 (financial decision screen)  
 can support forward workload of: 42,389,780 (10 x capital base)  
 Hence, the value of work that can be won cannot exceed: 21,598,430 during bidding

Job	Country	Type	BIM	Size	App Value	Duration	Description	Sector	Client	Job	Bid	Bid value
74	United Kingdom	DB	Yes	Medium	11,000,000	3	Social housing development	Building & Commercial	Lowry Homes	74	No	0
76	United Kingdom	DB	Yes	Medium	9,000,000	3	Construction of new bridge	Transport	North-West County Council	76	No	0
80	United Kingdom	DB	Yes	Small	2,000,000	3	Construction of library storeroom	Building & Commercial	Fenlands County Council	80	No	0
92	United Kingdom	BO	No	Small	2,000,000	3	Scheme to upgrade tidal defences	Water & Sewage	The Environment Department	92	No	0
93	United Kingdom	BO	Yes	Small	3,000,000	3	New state of art aviation museum	Building & Commercial	The Defence Agency	93	No	0
100	Qatar	BO	No	Small	2,000,000	3	Upgrade to a marina	Transport	Qatar 2022	100	No	0

Display details for job 74

Display client details

Yes



# BIM (Building Information Modelling)

**Setting the Bid for Job 74**

Help

**ESTIMATED COSTS**

Design cost (% of build cost): 11 %

Build cost: 8,388,002

Site cost: 1,677,600

**Total estimated costs: 10,988,280**

**KNOWN RIVAL BIDDERS**

Chota Nagpur Group Based in India

East State Enterprises

Horizon Group

Rempstone Building

The Bommell Group

**DESIGN CONSULTANT** BIM experience required

Design consultant allocated:  (Select)

**ONCE**

Project manager:  (for salary)

Risk register	Likelihood occurrence	Risk Contingency
Archaeological find	Low (20 to 30%)	0
Personnel issues	High (70 to 80%)	0
Construction defects	Medium (40 to 50%)	0
Structural defects	Medium (40 to 50%)	0

**BIDDING HISTORY**

Job	Period	Country	Sector	Markup
1	2	United Kingdom	Building & Commercial	4.3 %
4	2	United Arab Emirates	Building & Commercial	4.4 %
8	2	United Kingdom	Building & Commercial	4.3 %
13	2	Canada	Building & Commercial	4.3 %
15	2	South Africa	Building & Commercial	4.4 %
16	2	United Kingdom	Building & Commercial	4.3 %
17	2	Japan	Building & Commercial	4.5 %
21	2	United States	Building & Commercial	4.2 %
25	3	Qatar	Building & Commercial	4.1 %
30	3	United Kingdom	Building & Commercial	4.1 %
40	3	United States	Building & Commercial	4.2 %
44	3	Qatar	Building & Commercial	4.3 %
			Commercial	4.2 %
			Commercial	4.2 %
			Commercial	4.4 %
			Commercial	4.1 %
			Commercial	4.3 %
			Commercial	4.2 %

**BIM MODEL AFFECT WHEN BIDDING**

For Design & Build jobs, at the bidding stage a consultant needs to be allocated to produce the design, and if a BIM model is being used for the job, such as with job 74, **the client will insist** that a consultant designer is chosen with some BIM experience.

**BID SUBMITTED**

Bid submitted: 10,988,280

**USEFUL INFORMATION**

- The job is in the Building & Commercial sector
- The job is based in United Kingdom
- The planned duration of the job is 3 periods
- The annual salary for project managers ranges from 27,000 to 64,000

...own very quickly in the last 6 years, and are now operating worldwide in the commercial and real estate sector.

The strength of the Chota Nagpur Group is reflected in their recent flotation on the Indian Stock Exchange, and their turnover and profit have grown considerably in the last fiscal year.

Chota Nagpur Group have a de-risked business model that enables them to bid competitively on price for the work they tender for, helped enormously by their continuing investment in new technologies.



# BIM (Building Information Modelling)

**Procurement performance**  
Management consultant report

PREVIOUS BIDS      RIVAL BIDS

**Procurement Restrictions**

**NUMBER OF JOBS IN PROGRESS**  
 At the start of the period, the number of jobs in progress is: 6 (job progression screen)  
 The number of jobs in progress after bidding cannot exceed: 10 jobs  
 Hence, the maximum number of jobs that can be won is: 4 jobs during bidding

**VALUE OF WORK IN PROGRESS**  
 The initial forward workload is: 20,791,350 (job progression screen)  
 The current value of the capital base is: 4,238,978 (financial decision screen)  
 The current capital base can support forward workload of: 42,389,780 (10 x capital base)  
 Hence, the value of work that can be won cannot exceed: 21,598,430 during bidding

5      Full Tender Report

Job details							Bid details			
Period	Job	Country	Type	BIM	Sector	Client	Bid submitted	Won	Comment	Cumulative forward workload
5	74	United Kingdom	DB	Yes	Building & Commercial	Lowry Homes	11,696,790	No	Consultant had no BIM experience	20,791,350
5	76	United Kingdom	DB	Yes	Transport	North-West County Council	9,096,015	No	Bid too high	20,791,350
5	92	United Kingdom	BD	No	Water & Sewage	The Environment Department	2,169,138	No	Bid too high	20,791,350

Display details for job 74  
Tender report for job 74

If a consultant is allocated to a Design & Build job using a BIM model who does not have any BIM experience, the **client will reject the bid** due to **“Consultant had no BIM experience”**, as shown.



# BIM (Building Information Modelling)

Setting the Bid for Job 74

Help

**ESTIMATED COSTS**

Design cost (% of build cost): 11 %

Build cost: 8,388,002

Site cost: 1,677,600

**Total estimated costs: 10,988,280**

**KNOWN RIVAL BIDDERS**

Based in India

- Chota Nagpur Group
- East State Enterprises
- Horizon Group
- Rempstone Building
- The Bommell Group

**DESIGN CONSULTANT** BIM experience required

Design consultant allocated: Ardvark Architects

**BIDDING HISTORY**

Job	Period	Country	Sector	Markup
1	2	United Kingdom	Building & Commercial	4.3 %
4	2	United Arab Emirates	Building & Commercial	4.4 %

For Design and Build (DB) jobs using a BIM model, the consultant's **BIM experience can have a major affect** on the quality of the BIM model produced, which can then impact upon the build costs when the job is progressed.

For job 74, a Building and Commercial contract, **Ardvark Architects** have been chosen due to their expertise in the Building and Commercial sector, and since the job is using BIM, their **significant BIM experience**.

## ARDVARK ARCHITECTS



After meeting at a BIM conference 3 years ago a small group of design consultants established Ardvark Architects to take advantage of the emergence of Building Information Modelling in the construction process.

Since being established Ardvark Architects has undertaken a number of prestigious project designs within the building and commercial field, and their skills are becoming increasingly in demand as their reputation spreads.

The company have invested heavily in technology, and particularly in BIM training for their staff, to enable them to compete for new work against even their rivals.

### USEFUL INFORMATION

- The job is in the Building & Commercial sector
- The job is based in United Kingdom
- The planned duration of the job is 3 periods
- The annual salary for project managers ranges from 27,000 to 64,000

Chota Nagpur Group have a risk-averse business model that enables them to bid competitively on price for the work they tender for, helped enormously by their continuing investment in new technologies.



# BIM (Building Information Modelling)

## Consultant History

Navigate to "Main menu/Assessing performance/Consultant history"

Gradings

Name	Base	Job details					Factors affecting build costs				
		Job	Country	Status	Sector	BIM being used	Expertise in sector	BIM experience	Location	% change so far	
Ardvark Architects	UK	74	United Kingdom	1st period	Building & Commercial	Yes	noticeably reduces	significantly reduces	has no affect on		
The PW Partnership	UK	19	United Kingdom	Completed	Energy	Yes	noticeably reduces	noticeably reduces	has no affect on	-0.71 %	
		30	United Kingdom	Completed	Building & Commercial	Yes	noticeably reduces	noticeably reduces	has no affect on	-0.69 %	
		76	United Kingdom	1st period	Transport	Yes	noticeably reduces	noticeably reduces	has no affect on		

### ARDVARK ARCHITECTS

Profile: After meeting at a BIM conference 3 years ago a small group of design consultants established Ardvark Architects to take advantage of the emergence of Building Information Modelling in the construction process.

Since being established Ardvark Architects has undertaken a number of prestigious project designs within the building and commercial field, and their skills are becoming increasingly in demand as their reputation spreads.

The company have invested heavily in technology, and particularly in BIM training for their staff, to enable them to compete for new work against even their rivals.

significant



If job 74 is secured, and then progressed, we can use the **Consultant history** option to determine if our choice of Ardvark Architects is justified.



Clearly we made the right choice as Ardvark Architect's BIM experience **significantly reduces build costs**.





# BIM (Building Information Modelling)

**Job 74 (At the procurement stage)**

**BIM** Building Information Modelling is being used for the job

Period identified: 4  
 Country: United Kingdom  
 Location: Brixton  
 Type: Design & Build  
 Size: Medium  
 Approximate value: 11,000,000  
 Duration: 3 periods  
 Description: Social housing development  
 Sector: Building & Commercial  
 Client: Lowry Homes

**ESTIMATED COSTS / PLANNED LABOUR SCHEDULE**

Job period	Estimated build cost	Estimated site cost	Planned labour	Cumul % complete
1	2,516,401	503,280	77	30
2	4,194,001	838,800	129	80
3	1,677,600	335,520	51	100
	8,388,002	1,677,600	257	

Estimated design cost: 11 % of build cost

**RISK REGISTER**

Risk description	Likelihood occurs	Impact cost	Reduction in cost if BIM used	Expected labour reduction
Archaeological find	Low	175,000	No	10.6 %
Personnel issues	High	51,000	No	2.6 %
Construction defects	Medium	67,000	Yes	7.5 %
Structural defects	Medium	123,000	Yes	2.2 %

## BIM MODEL AFFECTS ON RISK COSTS

If the job is using BIM (Building Information Modelling), there may be an opportunity to reduce the impact cost if the risk occurs.

For example, for job 74 there is the risk of both 'construction defects' and 'structural defects', which may be identified in the BIM model, and the threat mitigated.



# BIM (Building Information Modelling)

Management consultant report Graphical analysis

ALL JOBS IDENTIFIED JOBS WON

- Summary
- Risk analysis (Cost)
- Risk analysis (Delays)
- Retention analysis

Job details					Risk details			The bid	Risk status		Mitigation adjustments				Adjusted cost	
Job	Status	In	BIM job	Sector	Risk description	Chance occurs	Impact cost	Contin in bid	Struck	In period	Invest	QHSE staff	Project mgr	BIM model	Adjusted risk cost	% of contin
109	Completed early	QAT	Yes	B&C	Utility installation issues	Medium	97,000	43,650	Yes	7	0.00 %	0.00 %	-5.58 %	-7.50 %	84,312	193 %
					Structural defects	Medium	117,000	52,650	Yes	7	0.00 %	0.00 %	-5.58 %	-12.50 %	95,846	182 %
					Personnel issues	High	70,000	52,500	Yes	7	0.00 %	0.00 %	-5.58 %	0.00 %	66,094	126 %
					Utility failure to site	Medium	70,000	31,500	No							
					JOB TOTALS			180,300							246,252	137 %

The risk cost reductions due to the use of the BIM model are graded depending upon the particular risk.

In the example shown on Job 109, 3 risks struck in period 7 but the use of the BIM Model had different affects :-

- For the risk 'Utility installations issues' the use of the **BIM model reduced the impact cost by 7.5%**, a decent cost saving.
- For the risk 'Structural defects' the use of the **BIM model reduced the impact cost by 12.5%**, an even greater cost saving.
- For the risk 'Personnel issues' the use of the **BIM model had no affect**.

					Personnel issues	High	73,000	54,750	Yes	8	0.00 %	0.00 %	-9.19 %	0.00 %	66,291	121 %
					JOB TOTALS			159,600							129,858	81 %
174	In progress	US	No	TRA	Personnel issues	High	16,000	12,000	No							
					Planning delays	Low	34,000	8,500	No							
					JOB TOTALS			20,500							0	0 %
178	In progress	QAT	No	B&C	Personnel issues	High	53,000	39,750	No							
					Structural defects	Medium	78,000	35,100	No							